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Study of Ecotoxicants in Environmental Objects Contaminated by Mining Industry Wastewater

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Abstract
A research study was conducted on Okchuchay, which was polluted with ecotoxic compounds. In order to investigate their pollution with pollutants, the upper, middle and lower reaches of the river were compared. Their decrease is observed from upstream to downstream. But there has been an increase over time and this is related with water streams and other factors.

Keywords: Ecotoxicant, pollutant, wastewater, ecology, physicochemical parameters.

Introduction

Recently, the pollution of the environment with ecotoxic compounds remains quite relevant. Thus, the atmosphere, the lithosphere, and the hydrosphere become saturated with pollutants in environmental objects. This affects the environmental balance and creates an imbalance. From this point of view, it is very important and urgent to investigate the hydrosphere, which is the rapid migration of ecotoxicants. For this purpose, we took Okchuchay as a research object to investigate the pollution of the hydrosphere with ecotoxic compounds (https://azertag.az/xeber/Oxchuchayin_chirklenme_gostericileri_arasdirilib-2412557). The migration of ecotoxicants was observed on it, and the dynamics of their density change was determined (Shachneva, 2012; Mur, et al. 1987).

Experımental Parts

Previously, water samples were taken from parts of the area of Jahangirbeyli, Shayifli, and Burunlu. Examples taken for the study have been studied by ISO, the physical and chemical parameters of their ingredients based on DUST standards (Table 1).

We used a pH-meter for the hydrogen indicator, an oximeter for dissolved oxygen, a conductometer for electrical conductivity, an autotitrator for sodium and chloride ions, a spectrometer for sulfate, ammonium, nitrate and nitrite ions, and an optical emission and atomic absorption spectrometer for metals (Hajiyeva, et al., 2019; Lurye, 1979; Korostilev, 1981; Charikov, 1984).

Table 1. Standards of indicators determined in water

№	Name of analysis	Method
1	Hydrogen indicator	İSO 10523
2	Electrical conductivity	İSO 7888
3	Dissolved oxygen	İSO 5814
4	Sodium	İSO 6059
5	Sulfate ions	DÜST 4389-72
6	Chloride ions	İSO 9297
7	Ammonium ions	DÜST 4192-82
8	Nitrite ions	İSO 6777
9	Nitrate ions	İSO 7890
10	Metals	İSO 11885

Result

The physical and chemical parameters of the previously taken water samples were studied. Sample analyzes were conducted earlier in January for the study of ecotoxic compounds. The results for all three areas taken are given in table 2.

It should also be noted that the Maximum Permissable Concentration for Surface water (MPC) was issued on 04 January 1994 by the Inspection Committee for Ecology and Nature of the Republic of Azerbaijan with the decree of "Prevention laws of surface water from polluted water".

As can be seen from Table 2, in the section passing through Jahangirbeyli and Sayifli villages of Okchuchay, sodium is 2.3 times, in the section passing through Burunlu village 2.4 times, iron - 1.3 times in the section passing through Sayifli village, 2.2 times in the section passing through Burunlu village, molybdenum - 1.2 times in the section passing through Burunlu village, manganese – 1.4 times in the section passing through Sayifli village and 4.9 times higher than MPC in the section passing through Burunlu village.

The fact that having metals more than the normal level in the environment has a serious effect on the aquatic biota. Perhaps, when the molybdenum is too much, the aquatic organisms absorb the metal, the process of the cumulative environment begins, and then the residual organism

disappears. Manganese is one of the most dangerous pollutants of the environment. When muttagen and allergenic manganese associations are introduced into living organisms, they deplete nektons (Hajiyeva, et al., 2021; Medvedev, et al., 2017; Davidova, 1991; Hajiyeva, et al. 2018; Hajiyeva, et al., 2019).

Repeated samples were taken from the same area on 25-26.01.2023 and re-examined on them. The obtained results are shown in table 3.

Table 2. Results of physico-chemical analyses conducted on water samples taken from the territory of East Zangezur and Karabakh economic region on 16-18.01.2023

№	Name of component	Unit of measure-ment	Amount of components			Permissible viscosity limits
			Okchuchay-Zangilan district			
			Jahangirbeyli village	Sayifli village	Burunlu village	
1	Hydrogen indicator, pH	—	7.9	7.5	7.6	6.5-8.5
2	Dissolved oxygen	mqO_2/l %	8.0 83.0	7.7 81.0	7.7 80.0	≥4.0
3	Electrical conductivity	$x10^{-3}$ Sm/sm	1.793	1.873	1.886	—
4	Sodium	mq-ekv/l	16.0	16.4	16.9	7.0
5	Chloride ions, Cl^-	mq/l	18.1	17.4	18.1	350
6	Sulfate ions, SO_4^{2-}	mq/l	369.8	372.1	385.0	500
7	Ammonium ions, NH_4^+	mq/l	0	0	0.1	0.5
8	Nitrite ions, NO_2^-	mq/l	0.21	0.34	0.37	3.3
9	Nitrate ions, NO_3^-	mq/l	5.9	5.3	7.1	45.0
10	Zinc, Zn	mkq/l	14.6	20.9	145	1000
11	Iron, Fe	mkq/l	181	392	645	300
12	Cobalt, Co	mkq/l	2.83	4.4	3.41	100
13	Lead, Pb	mkq/l	1.65	1.88	3.4	30
14	Nickel, Ni	mkq/l	1.06	0.642	1.49	100
15	Molybdenum, Mo	mkq/l	108	164	302	250
16	Manganese, Mn	mkq/l	89	144	491	100
17	Copper, Cu	mkq/l	18.1	21.0	52.1	1000

As can be seen from the analysis of the analyzes (table 3), during the analysis of water samples, it was found that in the section passing through the village of Jahangirbeyli of Okhuchay, sodium was 2.3 times, in the section passing through the villages of Sayifli and Burunlu, 2.4 times, sulfate ions - 1.1 times in the section passing through the village of Jahangirbeyli, 1.2 times in the section passing through the village of Sayifli. times, 1.3 times in the section passing through the village of section passing through the village of Sayifli, 1.3 times in the section passing through the village of Burunlu, manganese - 4 times in the section passing through the village of Jahangirbeyli, 5.7 times in the section passing through the village of Sayifli, 5.8 times in the section passing through the village of Burunlu.

Table 3. Results of physical and chemical analyzes conducted on water samples taken from the territory of East Zangezur and Karabakh economic region on 25-26.01.2023

№	Name of components	Unit of measure ment	Amount of components			Permissible viscosity limits
			Oxçuçay-Zəngilan rayonu			
			Jahangi rbeyli	Sayifli	Burunlu	
1	Hydrogen indicator, pH	—	7.9	7.5	7.5	6.5-8.5
2	Dissolved oxygen	mqO_2/L %	8.7 90.0	8.9 93.0	9.0 94.0	≥4.0
3	Electrical conductivity	x10^{-3} Sm/sm	1.812	1.807	1.823	—
4	Sodium	mq-ekv/l	16.1	16.5	16.3	7.0
5	Chloride ions, Cl^-	mq/l	18.0	17.9	17.2	350
6	Sulfate ions, SO_4^{2-}	mq/l	562.0	586.3	629.3	500
7	Ammonium ions, NH_4^+	mq/l	1.2	1.33	1.6	0.5
8	Nitrite ions, NO_2^-	mq/l	0.18	0.48	0.49	3.3
9	Nitrate ions, NO_3^-	mq/l	6.22	5.63	5.46	45.0
10	Zinc, Zn	mkq/l	68.0	152	143	1000
11	Iron, Fe	mkq/l	597	908	928	300
12	Cobalt, Co	mkq/l	3.60	5.44	4.2	100
13	Lead, Pb	mkq/l	<LOD	<LOD	<LOD	30
14	Nickel, Ni	mkq/l	1.04	3.68	3.49	100
15	Molybdenum, Mo	mkq/l	223	308	327	250
16	Manqanese, Mn	mkq/l	398	574	576	100
17	Copper, Cu	mkq/l	50.5	50.4	53.2	1000

Burunlu, ammonium ions - 2.4 times in the section passing through the village of Jahangirbeyli, 2.7 times in the section passing through the village

of Sayifli, 3.2 times in the section passing through the village of Burunlu, iron - 2 times in the section passing through the village of Jahangirbeyli, 3 times in the section passing through the village of Sayifli, Burunlu 3.1 times in the section passing through the village of molybdenum, 1.2 times in the
It is clear when comparing tables 2 and 3 that there has been an increase in a short period of time. Here, when comparing MPC, it can be seen that the maximum permissible concentration in the section passing through the villages of Jahangirbeyli and Sayifli has increased by 0.01 units, and by 0.1 units in the section passing through the village of Burunlu. Although iron was not detected in the section passing through the Jahangirbeyli village, it later exceeded the maximum permissible concentration by 2 times. In the section passing through Sayifli village, the MPC increased by 1.7 units and 0.9 units. Manganese pollution exceeded the normal level by 4 times in the section passing through the village of Jahangirbeyli, in the section passing through Shayifli villages, there was an increase of 4.3 units, and in Burunlu, there was an increase of 0.9 units. Molybdenum in the section passing through the villages of Sayifli, although it was within the MPC before, an increase of 1.2 units was observed. In the section passing through Burunlu village, there is an increase of 0.1 units of MPC. The increase of sulfate and ammonium ions, which did not exceed the maximum permissable concentration before, occurred at all three points. The decrease of some parameters from upstream to downstream is related to the self-regulation-cleaning function of the river at in a specific time period.

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